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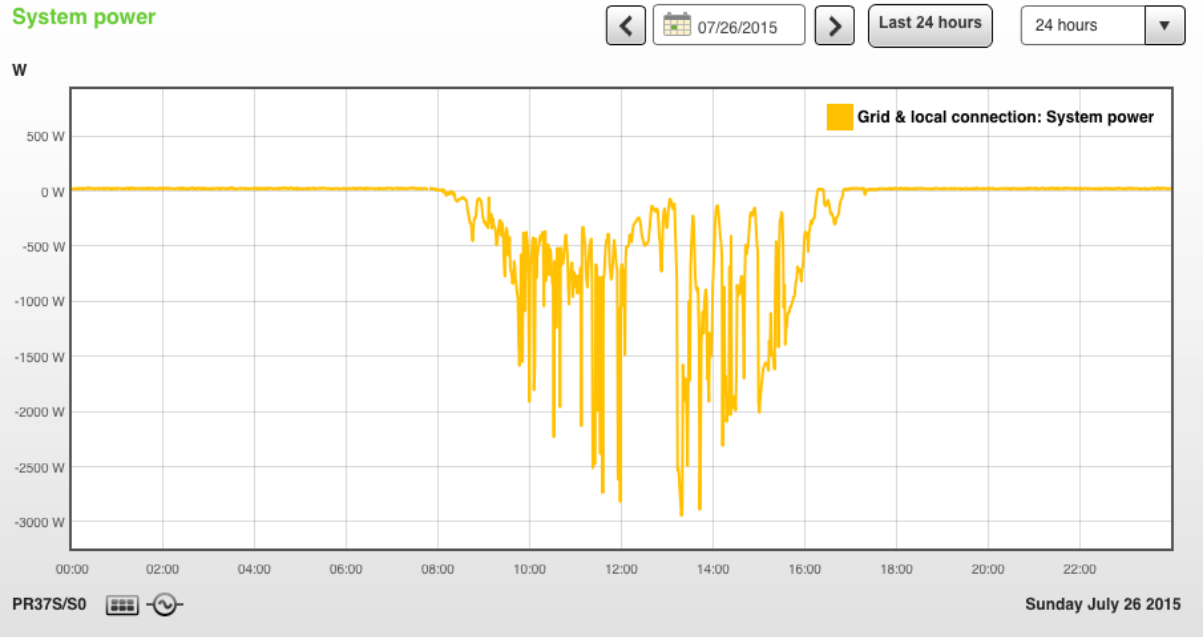
Submission on FiT from 1 JAN 2016

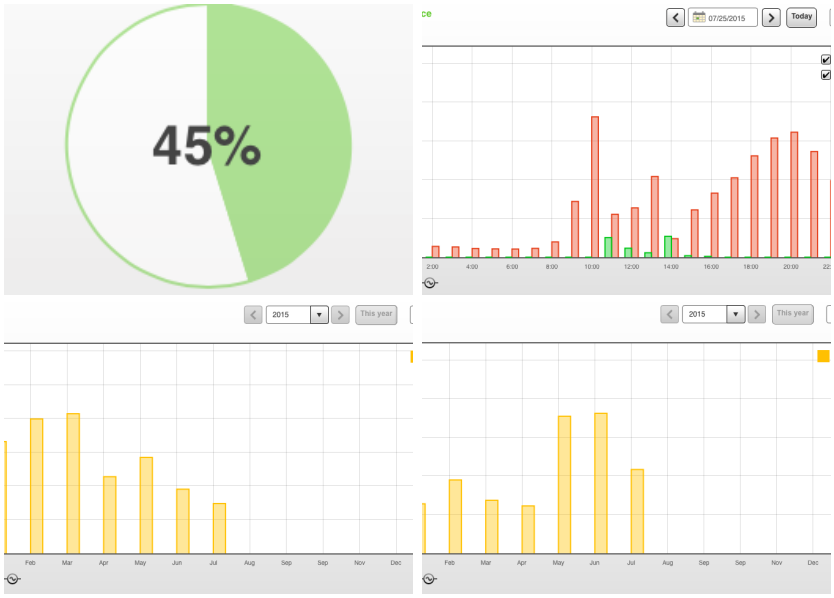


The Essential Services Commission (ESC) has invited comments on its draft decision dated June 2015: Minimum electricity feed-in tariff to apply from 1 January 2016 [1]. This submission is my response to this draft decision. This submission is intended both for the ESC and interested members of the public.

The ESC is responsible for determining the minimum rate that small customers such as us receive for electricity exported into the grid. This rate is called the Feed-in Tariff.

Interested members of the public may not realise what their return on investment is because they may not have the resources or the time to monitor it. I think the public will be concerned if they know how much worse off they are.

“The grid is like a huge Rottweiler eating us out of house and home”



The ESC should not make a decision that is biased towards the retailer, installer, distributor, or large scale generator at the expense of the small customer.

When we were evaluating whether to purchase a solar photovoltaic (PV) system, the feed-in tariff was eight cents per kilowatt (kW). After installation shortly after the PV system was operational, the tariff reduced to 6.5c/kW, a reduction of 18.75%. The ESC now proposes to reduce the feed-in tariff to 5.0c/kW, a reduction of 37.5%.

The words fair and reasonable are used five times in [1] but what is fair and reasonable about the retailer getting two thirds of our generated electricity for a fraction of its cost price?

Small scale producers cost price

The small scale producers cost per kilowatt, taking into account the cost of capital investment was over three times greater than the old Feed-in Tariff of 8c/kW. The cost price is

$$\frac{\text{PV system cost}}{\text{Kilowatts produced over useful life}}$$

converted from dollars per kilowatt into cents per kilowatt. While the PV system cost may be fixed, the useful life is a *random variable*. The ESC should bear in mind

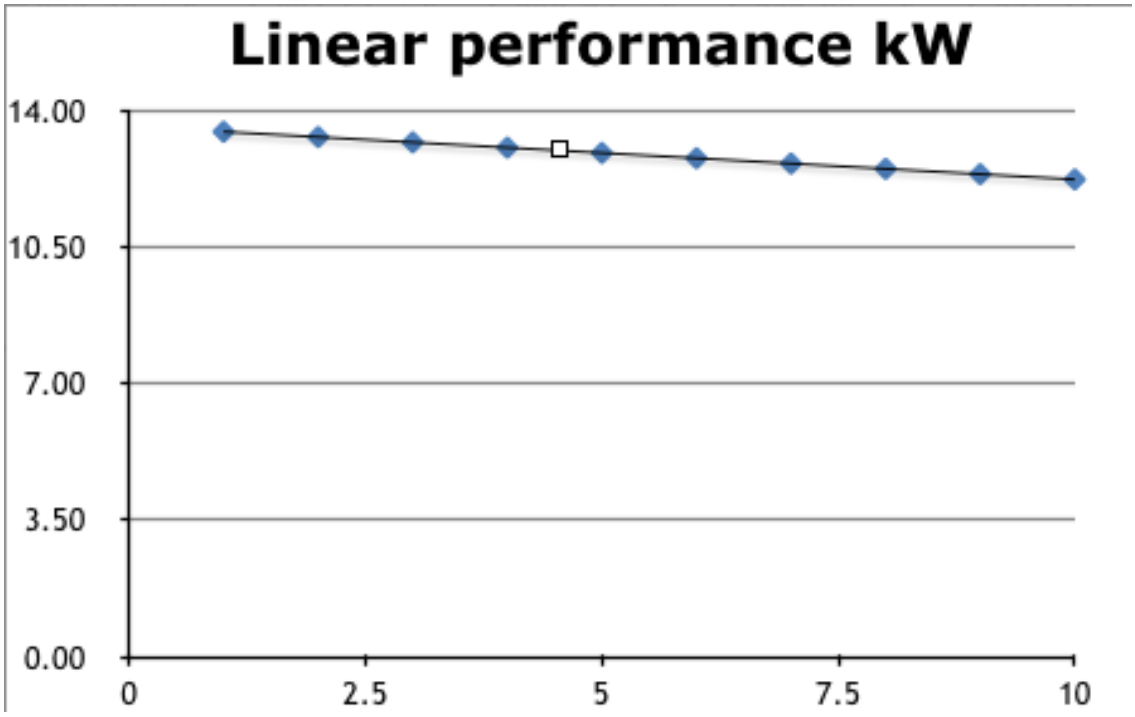
(1) the small scale producer cannot acquire a PV system with economies of scale

(2) the PV system is a piece of consumer electronics and is not durable enough

The useful life of a solar PV system is limited by the useful life of the inverter. Mean time to first failure (MTFF) for inverters is estimated to be between five and 10 years [2] A product with a five year warranty will have a expected lifetime of only 4.11 years, see Table 1 in [3].

expected lifetime 4.11 years

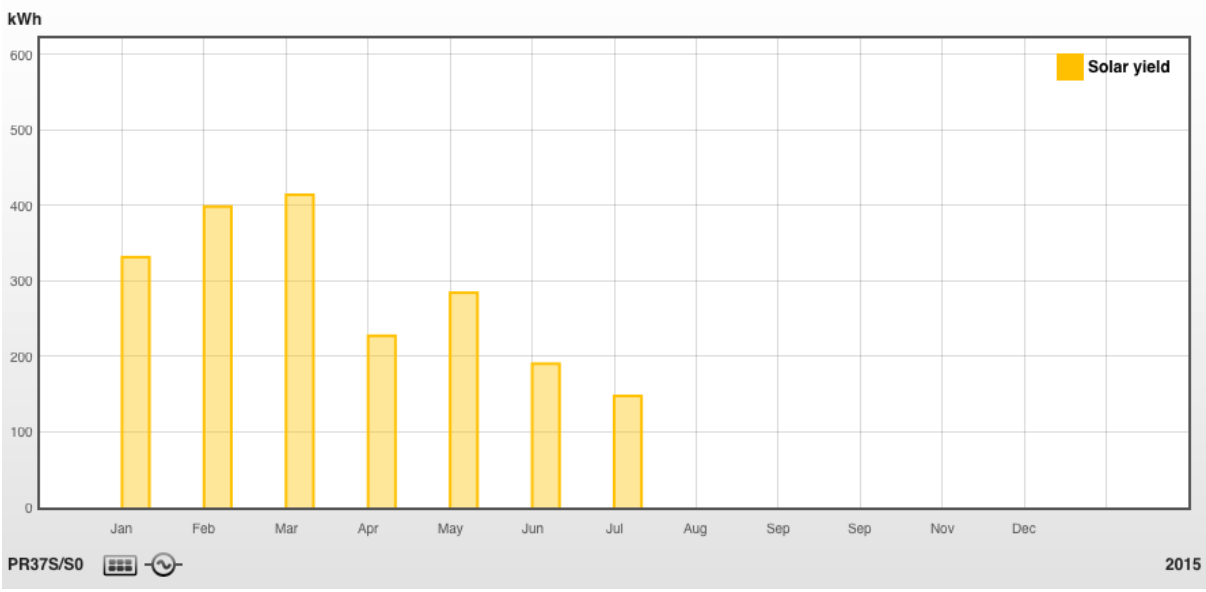
The kilowatts produced will not remain unchanged over the years because the nominal output deteriorates at least half a percent per year (see chart below).



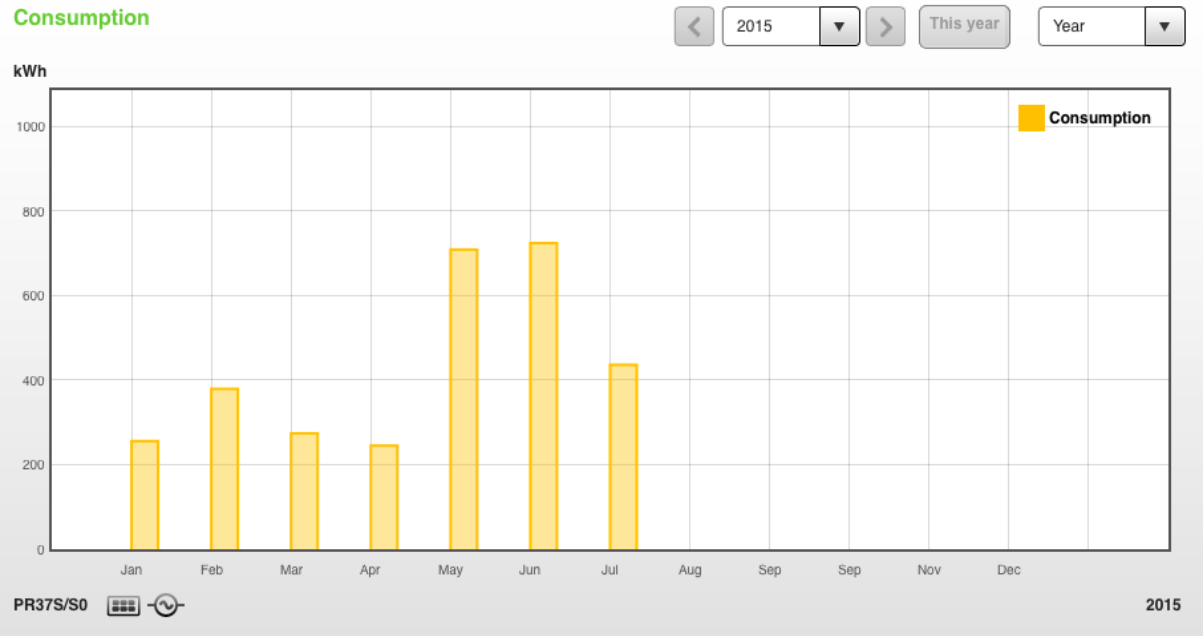
For the small scale producer investing in solar PV is more risky than money in the bank. Although it can produce savings, money from other investments can be withdrawn, whereas solar PV will expire after its useful life. The small scale producer needs a higher rate of return to compensate for the inability to withdraw their money.

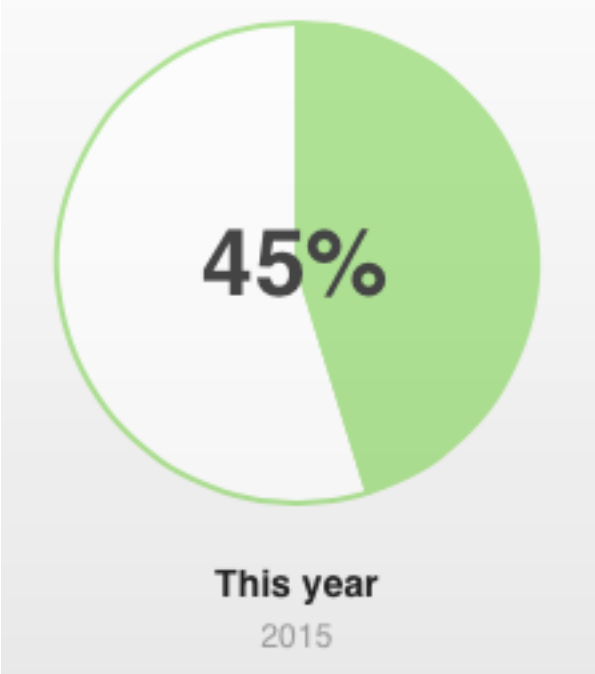
Small scale producers self-use ratio

The power produced by solar PV is volatile, as the graph “System power” shows. It varies according to the season, as the graph “Solar yield” displays below by month.



In order to achieve cost savings, the power that is generated should be directly consumed. The consumption graph is shown by month.





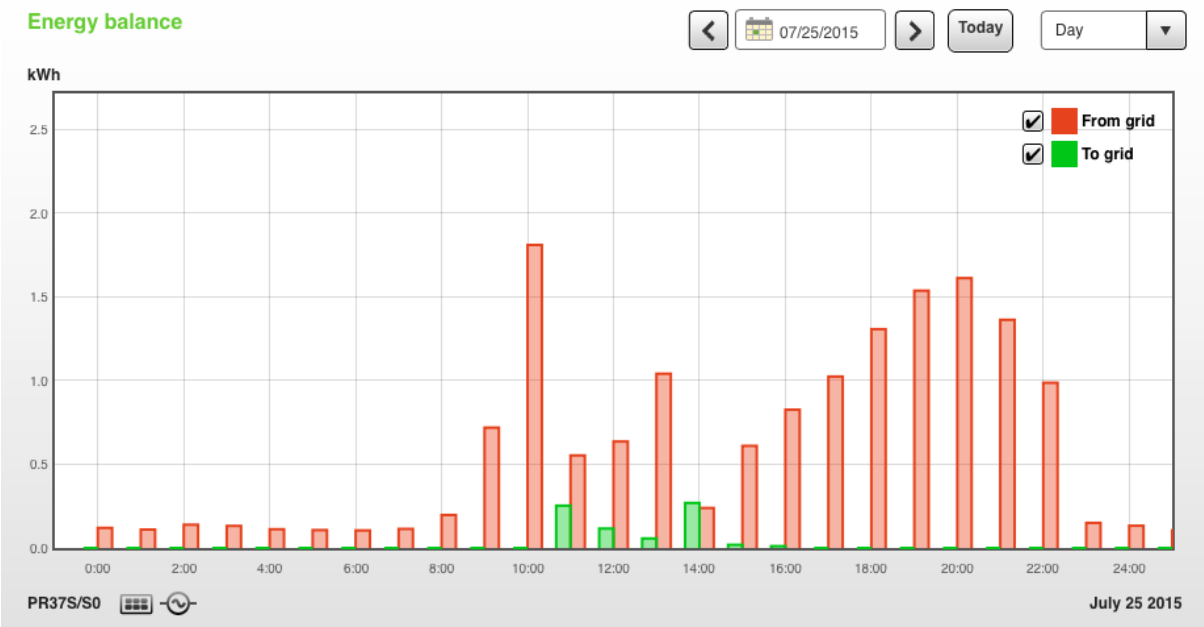
The key factor in matching consumption to solar yield is self-use ratio. A higher self-use ratio will also result in *more power drawn from the grid*.

One appliance dominates electricity usage, that is heating and cooling. The amount of energy consumed is proportional to the temperature difference between set temperature and outdoor temperature. The outdoor temperature is a random variable. This random variable determines the self-use ratio.

However the proportion of energy exported is much greater than 1 - self-use ratio.

Technical losses

For unknown reasons during the day time there is an exchange of energy between the solar PV and the grid. This is shown in “Energy balance” graph depicting kW from/to grid against hours.



This exchange results in a loss of over 20 cents per kilowatt for every such kilowatt exchanged.

over 20 cents a kW lost in PV/grid exchanges

This is due to the price disparity between energy bought from the retailer and energy sold to the retailer. The ESC should bear in mind we are paying for energy our own solar PV has produced, contrary to the net metering rule.

Retailer usage disparity

The usage shown on the retailers bill does not match the usage reported by our solar PV system. The usage on the bill has been higher than the *from grid* numbers reported by the solar PV system. This further compounds an already severe problem, and leads one to question the honesty and integrity of the electricity system.

Many customers have complained that directly after the smart meter replaced their old meter, their bills were higher. The smart meter can measure VARS as well as KW, but this should not be permitted for billing purposes. The reason for the disparity is not yet known and is being investigated.

Retailers can also shift more of their charges to the daily standing charge, thus frustrating the cost benefit of solar PV.

Contributions to doubling of payback time

When planning the decision to invest in solar PV we were told the rated efficiency of our solar PV would be 15.85%. We should have achieved cost savings giving us a five to six year payback time.

Instead of the intended five to six year payback we now have a payback time of over ten years, this is many years longer than the expected life of the inverter of 4.11 years. None of this is as it should be, the electricity grid is like a huge Rottweiler eating us out of house and home.

There are many contributing factors tabulated below. No inference should be drawn as to the relative weight of these contributing factors.

	Percentage lost
Yield kW	-25%
Feed-in tariff	-18.75%
Self-use ratio	-55%
Technical losses (APR)	-84%
Retailer disparity	-5%

In the six months to date our solar PV has produced on average 9.97 kW per day, 25% less energy than it should have produced. On an annual average the solar PV should have produced 13.3 kW per day.

Two thirds of energy produced was sent to the grid, which we had never intended and wanted to stop with the feed-in limiter. The useful lifetime of my inverter can be extended by placing less load

on it, by eliminating the feed-in, the inverter will not run hot constantly. The installer did not comply with my request nearly six months ago.

The self-use ratio is 55% lower than intended, but improving this also draws more energy from the grid. The ESC should note their policy settings are unintentionally giving small customers an incentive to use more energy and be less energy efficient.

The ESC should note that our pay back has been hampered by 18.75% reduction in the feed-in tariff. If the ESC continues with the planned reduction it will worsen to 37.5%.

The technical losses have been valued in terms of the difference in Annual Percentage Rate (APR) of 111% to the retailer minus 27% APR to the small customer.

The retailer disparity was explained in the section Retailer usage disparity.

Conclusion

The electricity system is complicated with multiple parties involved whom I perceive as cowboy operators: PV manufacturer, PV installer, electricity distributor and electricity retailer.

The government needs to make changes to ensure that the small customer who invests their hard earned money in renewable energy (like solar PV) actually gets the savings they are entitled to.

To place this in context, let us compare against borrowing and repaying money in half an hour intervals. In order to borrow a kilowatt and repay it in half an hour the small customer pays in interest twenty cents, giving the retailer a half hour interest rate of 75% and an effective interest rate (APR) of 111% per annum [4]. Vice versa, in order to borrow a kilowatt and repay it in half an hour the retailer pays in interest 6.5 cents, giving the small customer a half hour interest rate of 24% and an effective interest rate (APR) of 27% per annum. How does the ESC justify such a bias if it wants to be fair and reasonable?

The Essential Services Commission is urged to

(1) reconsider its decision to reduce the feed-in tariff to five cents per kilowatt;

(2) to review its methodology it uses in future to set this feed-in tariff;

(3) to set in place an opt-out mechanism to stop feed-in which places an excessive public load on private equipment of limited durability

References

[1] Essential Services Commission 2015, **Minimum Electricity Feed-in Tariff to Apply from** 1 January 2016: Draft decision, June 2015

[2] Module Behavior, Apr 1, 2009 12:00 PM, By Beck Ireland, Staff Writer- Prolonging PV module life by improving inverter maintenance and manufacturing
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[3] Zhi-Jie Liu, Hong-Zhong Huang, D. N. P. Murthy, Optimal Reliability and Price Choices for Products Under Warranty, IEEE Xplore, February 2006
http://www.researchgate.net/profile/Zhi_Jie_Liu/publication/224644108_Optimal_reliability_and_price_choices_for_products_under_warranty/links/54645f9c0cf2837efdb3558a.pdf

[4] Effective interest rate, Wikipedia article retrieved 26 June 2016
https://en.wikipedia.org/wiki/Effective_interest_rate